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MATH211

[ST]

END SEMESTER EXAMINATION : NOV.–DEC., 2019

APPLIED MATHEMATICS – III

Time : 3 Hrs. *Maximum Marks : 70*

Note: ***Attempt questions from all sections as directed. Use of scientific calculator is allowed.***

SECTION – A (30 Marks)

Attempt any **five** *questions out of* **six**.

Each question carries **06** *marks.*

1. Obtain the half range sine series for the function $f(x) = x^2$ in the interval $0 < x < 3$.

2. Obtain the first three coefficients in the Fourier cosine series for y, where y is given in the following table :

x :	0	1	2	3	4	5
y :	4	8	15	7	6	2

3. Solve Lagrange's linear partial differential equation $y^2p - xyq = x(z - 2y)$.

P.T.O.

4. Form the partial differential equation by the elimination

of f from $z = y^2 + 2f\left(\frac{1}{x} + \log y\right)$.

5. Solve by method of separation of variables

$4\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} = 3u$, given $u = 3e^{-y} - e^{-5y}$, when $x = 0$.

6. Solve the integral equation

$$\int_0^{\infty} f(x)\cos px\, dx = \begin{cases} 1-p, & 0 \le p \le 1 \\ 0, & p \ge 1 \end{cases}$$

Hence deduce that $\int_0^{\infty} \frac{\sin^2 t}{t^2}\, dt = \frac{\pi}{2}$.

SECTION – B (20 Marks)

Attempt any **two** *questions out of* **three.**
Each question carries **10** *marks.*

7. Find the Fourier cosine transform of $F(x) = \frac{1}{(1+x^2)}$

and hence find Fourier sine transform of $F(x) = \frac{x}{(1+x^2)}$.

8. Find the temperaturein a bar of length 2 whose ends are kept at zero and lateral surface insulated if the initial temperature is $\sin\frac{\pi x}{2}+3\sin\frac{5\pi x}{2}$.

9. (a) Obtain the Fourier series to represent the function $f(x) = |\sin x|$ for $-\pi < x < \pi$. (7)

(b) Classify the partial differential equation

$$x\frac{\partial^2 u}{\partial x^2}+t\frac{\partial^2 u}{\partial x \partial t}+\frac{\partial^2 u}{\partial t^2}=0 \quad (3)$$

SECTION – C (20 Marks)

(Compulsory)

10. (a) Solve the non-homogeneous linear partial differential equation

$$(3D^2 - 2D'^2 + D - 1)z = 4e^{x+y} \cos(x + y). \quad (7)$$

(b) Solve of Charpit's method $z = p^2x + q^2y$. (7)

(c) A string of length '1' is initially at rest in equilibrium position and at each of its points velocity is given

P.T.O.

$\frac{\partial y}{\partial t} = b \sin^3 \frac{\pi x}{\iota}$, at $t = 0$. Find the displacement $y(x, t)$. (6)

(2400)